30

Academies K

8 Yob. d. 25

1—5.

An Extract of the Minutes of the Royal Society, of February 19, 1746.

The Preſident in the Chair.

BRITISH MUSEUM

THE Preſident read a Paper, containing an Account of ſome magnetical Experiments which he, in Company with *William Jones*, Eſq; ſaw on *Wedneſday* the 11th of this inſtant *February*, at the Houſe of Dr. *Gowin Knight*.

The Doctor, he ſays, having produced two ſquare Bars of harden'd Steel, of the Length of about 15 Inches, and of the Breadth and Thickneſs of about half an Inch, and to which he had communicated a ſtrong magnetic Virtue, laid thoſe Bars down upon a Table, ſo as to be nearly in a ſtrait Line, the North Pole of the one being next to the South Pole of the other, and at the Diſtance of about half an Inch from it. A ſmall flat Piece of natural Loadſtone was then placed between theſe Bars, ſo as to be in Contact with the Ends of them both, that were next to each other; where when it had only remained a few Moments, it was found that upon taking it out, the Part of the Stone which had been contiguous to the North Pole of the Bar, attracted the North End of a Compaſs Needle, and that the Part of the Stone which had been contiguous to the South Pole of the other Bar, attracted in like Manner the South End of the ſame Compaſs Needle; and this in whatever Poſition the natural Loadſtone was placed

placed between the Bars: So that, in these Experiments, the Poles of the Stone were first inverted, and then set at Right-angles to the Direction in which they at first lay.

That Dr. *Knight* then gave a strong Touch to two large Sea Compass Needles, the one temper'd, and the other quite hard; which was done by placing them, successively, one half Part upon one Bar, and the other half Part upon the other; and then drawing away the Bars, till they were clear of the Needles: By which Operations, both the Needles not only acquired a strong Verticity, but were also enabled to lift with either of their Ends a Weight of better than an Ounce and an half.

NOTE I.

"The Weight here made use of consisted of "two Pieces of soft Iron joined together with "wax, each Piece weighing about 15 Penny-"weights; which Weights were sent from "*Deptford*, as a Standard of the Strength of a "Needle touch'd upon their Loadstone, one "of the Weights being the utmost which that "Loadstone could make a Needle lift. Where-"fore this Experiment shews, that these mag-"netic Bars would give a Touch twice as "strong as the *Deptford* Loadstone, for it made "the Needles lift two such Weights; they also "made the harden'd Steel lift as much as the "temper'd one."

That these two Needles were then applied to each other; first, the Northern End of the one, in a contrary Direction to the Northern

End

End of the other, and then the Southern End of the firſt in like Manner to the Southern End of the other; from which Poſitions, being drawn aſunder, it was found, that the temper'd Needle had in a Manner loſt all its Virtue, but that the other would ſtill, with either of its Ends, lift better than half of the Weight it lifted before.

NOTE II.

" The Intention of this Experiment was to " ſhew how much more durable the Magnetic " Virtue was, when communicated to a Needle " quite hard, than when given to a Needle " temper'd of a Spring Temper (as it muſt be " when touched upon a natural Loadſtone) for " by this rough Treatment the temper'd Needle " was render'd quite uſeleſs, whereas the hard- " en'd one was yet a ſtronger than they could " make at *Deptford*."

That Dr. *Knight* then touched upon the large Bars one of his ſmall common magnetic Bars, in the ſame Manner as he had juſt before touch'd the large Needles; and this Bar, which was applied in a contrary Direction of the Polarity it already had, had its Poles thereby inverted, and lifted after the Touch, with one of its Ends, better than 6 Ounces and 8 Penny-weights.

That Dr. *Knight* laſtly produced one of his large artificial armed Magnets, compoſed of thin Plates of Steel cramp'd together, with which he lifted before them 31 Pounds and 9 Ounces. That with this Magnet, by touching in the common Way the temper'd Needle upon its armed Poles,

he

he again reſtored ſo much of its former Virtue, as to lift with one of its Ends about three Quarters of an Ounce.

NOTE III.

" This Experiment ſhews, that the armed " Magnet gave a Touch nearly of the ſame " Strength with the Loadſtone at *Deptford*, and " that the former Method of touching with " the two Bars was much preferable both to " the Touch of the natural Loadſtone, and of " the beſt artificial Magnets when armed."

And that by touching in like Manner, but in a contrary Senſe, the hard Needle (which yet retained a great Share, as it was obſerved, of its former Virtue) he not only deſtroy'd the ſame, but gave it a new Polarity the contrary Way; but that it would not, after this new Touch, lift more than 9 Penny-weights, that is to ſay, not half what it lifted when touch'd upon the large Steel Bars.

NOTE IV.

" Whence it appears that an hard Needle re- " ceives but little Virtue from an armed Magnet, " when touch'd in the common Manner."

The Preſident had Thanks for this Report; after which, Dr. *Knight* produced before the Society the two large Bars, and all the other Particulars mention'd in the Report, with which he repeated publickly all the ſeveral Experiments mention'd above, and which, notwithſtanding all the diſadvantageous Circumſtances of the Place, ſucceeded perfectly in every Particular, to the Satisfaction of the Company.

It being then propoſed, that the temper'd Needle, having its Virtue again deſtroy'd, ſhould be touch'd on the fine *Terella* belonging to the Society (which was the noble Preſent of their very worthy Member, the right honourable the late Earl of *Abercorn*, is eſteemed one of the beſt in *England*, and is ſaid to have lifted in his Lordſhip's Hands upwards of 40 Pounds) the ſame was immediately brought up, and the Needle being touch'd therewith, it was found to have acquired a ſtrong Polarity, and to lift about the ſame Weight, as when touch'd on the Doctor's large armed artificial Magnet, that is to ſay, about 15 Pennyweights.

NOTE V.

" This Experiment only ſerves to ſhew, that " this celebrated Loadſtone gives a Touch nearly " the ſame with that at *Deptford*, and the " armed Magnet above-mention'd; ſo that the " two moſt eſteem'd Loadſtones in the King- " dom will not give a Touch, even to a tem- " per'd Needle, of more than half the Strength " of one touch'd by theſe Bars, and it is well " known that no natural Loadſtone will give " a good Touch to an harden'd Needle."

The Thanks of the Society were given to Dr. *Knight*, for his curious Experiments then ſhewn before them.

An Account of ſome new Improvements in Artificial Magnets, communicated to the Royal Society, *by* Gowin Knight, *M.B. F.R.S.*

THE *Apparatus* for touching of Needles (which I lately had the Honour to ſhew to the Society) was as perfect as I could have wiſh'd, as far as relates to the intended Uſe of it; but the Manner, in which the two Bars were diſpoſed in their Caſes, render'd the Length of them ſomewhat incommodious, eſpecially in thoſe of the largeſt Size. This made me deſirous of trying if ſome Method could not be found out, of placing the Bars parallel to each other, without Danger of weakening their Force; by which Means the Caſes would be reduced to half their Length. I remember'd that ſome Years ago I had tried ſome Experiments to this Purpoſe by placing ſome Bars parallel, and in Contact, but ſo that their Poles were turned different Ways; in which Poſition I found the Virtue of ſome of them remain'd pretty entire, but that others were weaken'd thereby. I imagined the Reaſon of their loſing their Force was this; that the magnetic Virtue was by Degrees habituated to paſs out of the Side of one Bar into that of the other in Contact with it, and thereby was hinder'd from arriving at the Ends in it's full Vigour. The Reaſon why ſome ſuffer'd more than others was doubtleſs to be aſcribed to their Difference in Temper. I repeated the Experiment about 2 Months ago with a little Alteration. I placed the Bars parallel, with their Poles in an alternate Poſition, as before, but not in Contact; having kept them at the Diſtance of about a Quarter of an Inch. Then I apply'd to their

their Ends two Pieces of ſoft Iron. Each Piece was laid a-croſs, from the North End of one Bar to the South of the other; in the ſame manner as the Lifter is apply'd to the Feet of an armed Loadſtone. The Intention of this was, to draw the magnetic Virtue thereby down to the Ends of the Bars, and to convey it through the Pieces of Iron from one Bar to the other. In this Condition I let them lie for about a Month, and then try'd if they would lift the ſame Weight as before; which I found they did, and I thought with much more Vigour. After this, I repeated the Experiment with other Bars of various Sizes, and with the ſame Succeſs. I have therefore now ventured to fit them up in Caſes, in the Manner juſt deſcribed.

The Succeſs of this Experiment has led me to another Improvement: I provided a Caſe of Braſs, that wou'd juſt contain two Bars, ſuch as are ſold for half a Guinea. At one End of the Caſe was fixed two Feet of ſoft Iron like thoſe of an armed Loadſtone, the upper Surfaces of which were, within the Caſe, in Contact with the Ends of the two Bars; which being parallel to each other, and their Poles in an alternate Poſition, the North End of one Bar will be in Contact with one of the Feet, and the South End of the other Bar will be in like Manner apply'd to the upper Surface of the other Foot. Upon fitting a Lifter to this new Kind of Armour, I found I was able to ſupport a Weight of about 6 Pounds. The Bars are kept aſunder at the Diſtance of about one Quarter of an Inch, by a Slip of Wood which ſlides in betwixt them.

An

An Inſtrument thus conſtructed ſeems capable of anſwering all the Purpoſes for which Loadſtones are uſed: For when the Bars are taken out of the Caſe, they are fit for touching of Needles, or other magnetical Uſes which may require ſingle Bars: When in the Caſe, the whole together becomes an armed Magnet, able to lift a conſiderable Weight. And if we want to ſeparate Iron Filings from thoſe of other Metals, the Feet and all the lower Parts of the Caſe will take them up in great Plenty, and by drawing the Bars a little Way out of the Caſe, the Filings will fall off.

N. B. The *Apparatus* for touching of Needles is made of four different Sizes. The Price of each Sort is proportionable to the Size of the Bars. Thoſe of the Dimenſions deſcribed in the Minutes are ſold for 10 Guineas, the ſecond ſort for 5 Guineas, the third Sort for 2 Guineas and a half, and the ſmalleſt Sort for 1l. 5s. The Cautions neceſſary to be obſerved, in order to preſerve them in their full Vigour, are — Firſt, Never to let the two North or two South Poles approach each other. Secondly, Never to take one Bar ſingly out of the Caſe, but let them both ſlide out together upon a Table, with the Irons at their Ends, and the Partition betwixt them; then taking off one of the Irons, move the two Poles, to which it adhered, aſunder, in the Manner you would open a Pair of Compaſſes, till the Bars are brought to lie in a right Line, the North Pole of one Bar being oppoſed to the South of the other; then the other Iron and the Partition being removed, they are in a Poſture fit for Uſe: In reſtoring them again into the Caſe, obſerve the ſame Rule inverted. Thirdly, If you attempt to invert the Poles of too big a Loadſtone, or to touch a Piece of Steel of too large Dimenſions, the Bars will be weaken'd thereby: The three firſt Sorts will touch the largeſt Needles in Uſe without Danger of impairing their Strength, and invert any Loadſtone not exceeding half an Ounce in Weight. Fourthly, Never let them lie long near another Loadſtone or Magnet, or any large Piece of Iron or Steel.

Theſe Rules being obſerved, they will never loſe any thing of their Force; and they may lie in any Poſture when put up in their Caſes.

3 DE60